

TRIGONOMETRY - Unit 6

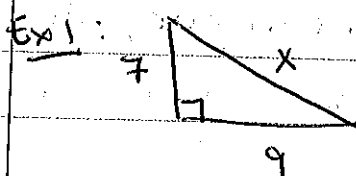
Tools that work only for right triangles

- Pythagorean Theorem
- SOH-CAH-TOA

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

* a, b are the sides (which is which doesn't matter)
c is the hypotenuse!

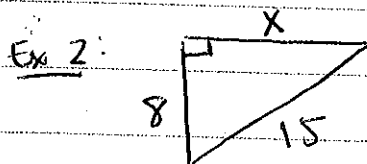


$$7^2 + 9^2 = x^2$$

$$49 + 81 = x^2$$

$$130 = x^2$$

$$x = \sqrt{130} \approx 11.4$$



$$8^2 + x^2 = 15^2$$

$$64 + x^2 = 225$$

$$-64 \quad -64$$

$$x^2 = 161$$

$$x = \sqrt{161} \approx 12.69$$

Labeling Sides

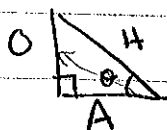
θ = "theta" - used as the mystery reference angle



H = hypotenuse

- longest leg

- across from right angle



O = opposite

- put pen through θ to find it

A = adjacent

Six Basic Trig Functions

SOH - CAH - TOA

Function - top - bottom

sine $\sin \theta = \frac{O}{H}$

cosecant $\csc \theta = \frac{H}{O}$

cosine $\cos \theta = \frac{A}{H}$

secant $\sec \theta = \frac{H}{A}$

tangent $\tan \theta = \frac{O}{A}$

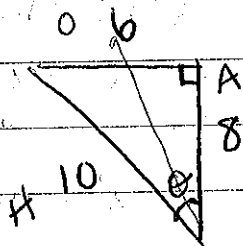
cotangent $\cot \theta = \frac{A}{O}$

reciprocals of \sin, \cos, \tan

* To find these on calc, do

$1 \div \sin, 1 \div \cos, 1 \div \tan$

Ex 1: Find the value of the 6 trig functions



$$\sin \theta = \frac{6}{10} = \frac{3}{5}$$

$$\csc \theta = \frac{10}{6} = \frac{5}{3}$$

$$\cos \theta = \frac{8}{10} = \frac{4}{5}$$

$$\sec \theta = \frac{10}{8} = \frac{5}{4}$$

$$\tan \theta = \frac{6}{8} = \frac{3}{4}$$

$$\cot \theta = \frac{8}{6} = \frac{4}{3}$$

S1: Find missing side

$$a^2 + 8^2 = 10^2$$

$$a^2 = 36$$

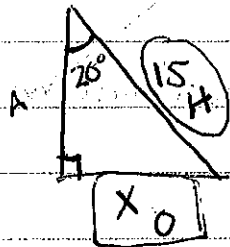
$$a = 6$$

S2: Label sides!

Using SOH-CAH-TOA to find Missing Pieces

- ① Label sides
- ② Decide which function to use based on sides
- ③ Set-up equation + solve

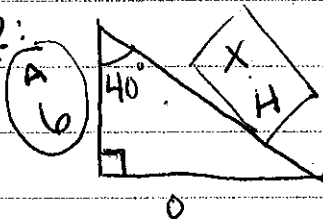
Ex 1:



$$15 \cdot \sin 20 = \frac{X}{15} \cdot 15$$

$$15 \cdot \sin 20 = X \approx 5.13$$

Ex 2:



$$X \cdot \cos 40 = \frac{6}{X} \cdot X$$

$$X \cdot \frac{\cos 40}{\cos 40} = \frac{6}{\cos 40}$$

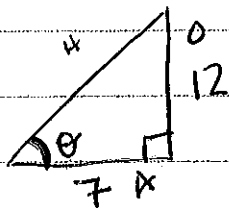
$$X = \frac{6}{\cos 40} \approx 7.83$$

SHORTCUT

$$\cos 40 = \frac{6}{X}$$

switch

Ex 3:



Find θ

$$\tan \theta = \frac{12}{7}$$

$$\theta = \tan^{-1}\left(\frac{12}{7}\right)$$

$$\theta \approx 59.7^\circ$$

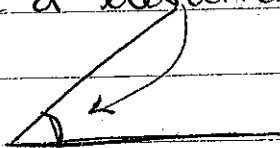
When finding angles, must

use inverse
 \sin^{-1} , \cos^{-1} , \tan^{-1}
 on calc 2nd + $\boxed{\sin}$
 $\boxed{\cos}$
 $\boxed{\tan}$

For Word Problems

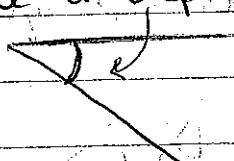
* Draw a picture!!

Angle of elevation



up from horizontal

Angle of depression



down from horizontal